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MECHANICAL-PROPERTY DATA

62Be-38Al ALLOY

Annealed Sheet

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Air Force Materials Laboratory
Research and Technology Division
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

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This data sheet was prepared by Battelle Memorial Institute under Contract AF 33(615)-2494. The contract was initiated under Project No. 7381, "Materials Application", Task No. 738106, "Design Information Development". The major objectives of this program are to evaluate newly developed structural materials of potential Air Force weapons-system interest and then to provide data-sheet-type presentations of mechanical data. The program was assigned to the Structural Materials Engineering Division at Battelle under the supervision of Mr. Walter S. Hyler. Project engineer was Mr. Omar Deel. The program was administered under the direction of the Air Force Materials Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, by Mr. Marvin Knight, project engineer.

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62Be-38Al

This material is a recently developed alloy containing 62 percent beryllium and 38 percent aluminum. It was developed specifically for aerospace structural applications and has useful structural properties at elevated temperatures.

The alloy combines high modulus and low density with the high formability and machining characteristics of the more common magnesium alloys.

62Be-38Al has been joined by fusion welding using both TIG and electron-beam techniques. Limited tests indicate that brazing and soldering may require special techniques and handling procedures.

Observance of the same exposure criteria as used for working or handling beryllium is recommended for 62Be-38Al.

This material is currently available in sheet form 0.032 to 0.100 inch in thickness, up to 12-inch widths and 24-inch lengths.

62Be-38Al ALLOY SHEET DATA

Condition: Annealed(a)

Thickness: 0.062 inch

Properties	Temperature, F				
	-320	RT	400	600	800
<u>Tensile(c)</u>					
F_{tu} (longitudinal), ksi	60.1	50.4	39.0	22.0	24.3
F_{tu} (transverse), ksi	58.8	50.9	39.7	22.2	24.1
F_{ty} (longitudinal), ksi	41.8	36.6	30.9	21.0	21.0
F_{ty} (transverse), ksi	43.1	36.1	31.3	21.2	20.7
e_t (longitudinal), percent in 1 in.	2.4	8.1	10.6	4.0	5.0
e_t (transverse), percent in 1 in.	2.8	8.2	11.9	5.0	5.5
RA (longitudinal), percent	2.4	7.3	13.4	--	10.8
RA (transverse), percent	2.8	8.6	14.6	--	11.2
E_t (longitudinal), 10^6 psi	30.0	29.2	28.8	20.5	16.9
E_t (transverse), 10^6 psi	30.0	29.1	30.1	19.7	17.2
<u>Compression(c)</u>					
F_{cy} (longitudinal), ksi		34.2	27.7	24.4	14.0
F_{cy} (transverse), ksi		34.3	28.4	23.8	14.4
E_c (longitudinal), 10^6 psi		29.1	29.4	19.7	17.0
E_c (transverse), 10^6 psi		29.1	29.4	19.2	17.0
<u>Impact</u> (V-notch Charpy), ft-lb		U(b)	U	U	U

(6 pp) (5 fig.) (tbls..) (2 ref.)

62Be-38Al ALLOY SHEET DATA (Continued)

Properties	Temperature, F				
	-320	RT	400	600	800
Fracture Toughness (K_{IC}) ^(d)		No pop-in	U	U	U
Bend ^(e) (min. radius), degrees					
Longitudinal	28	44	U	25	U
Transverse	32	39	U	29	U
Shear ^(e)					
F_{su} (longitudinal), ksi		27.2	21.5	U	10.8
F_{su} (transverse), ksi		27.0	21.6	U	10.7
Axial Fatigue (Transverse) ^(f)					
Unnotched, R = 0.1					
10^3 cycles, ksi		46.0	32.0	25.0	U
10^5 cycles, ksi		34.0	26.0	21.0	U
10^7 cycles, ksi		28.0	21.0	18.0	U
Notched, R = 0.1, $K_t = 3.0$					
10^3 cycles, ksi		35.0	32.0	23.0	U
10^5 cycles, ksi		21.0	20.0	15.0	U
10^7 cycles, ksi		15.0	13.0	9.0	U
Creep (transverse) ^(g)					
0.5% elongation 100 hr, ksi		NA ^(b)	20.5	11.0	2.7
0.5% elongation 1000 hr, ksi		NA	19.0	9.2	2.0
Stress Rupture ^(g)					
Rupture 100 hr, ksi		NA	23.0	12.0	3.5
Rupture 1000 hr, ksi		NA	21.0	10.0	2.5
Stress Corrosion ^(h)					
80 percent F_{ty} 1000 hr, max.		No cracks	U	U	U
Coefficient of Thermal Expansion ⁽ⁱ⁾ , in./in./F					
77 to 300 F = 9.2					
77 to 800 F = 10.3					
Density ⁽ⁱ⁾ , lb/in. ³					
					0.0756

Notes:

(a)

Boiling (a)

RT

600

600

600

600

600

600

600

600

600

600

600

600

600

600

600

(a) Annealed 1200 F, 24 hr; etched aqueous solution 2 percent hydrofluoric acid, 28 percent nitric acid.

(b) NA, not applicable; U, unavailable.

(c) Data at 600 F are average of triplicate tests at Battelle; all other data from Reference (1).

(d) Fatigue-cracked center-cracked specimens (0.062 x 3 x 12 inch).

(e) Values from Reference (1). Bend test, 3-point single beam; shear test, shear single shear.

(f) "R" represents logarithm ratio of the minimum stress to the maximum stress in one cycle; that is, $R = \log_{10} \sigma_{min} / \log_{10} \sigma_{max}$. "K_t"

represents Neuber-Peterson theoretical stress concentration factor.

(g) Values from Battelle tests.

(h) Alternate immersion 3 1/2 percent NaCl, 3-point loading bend test.

(i) Values from Reference (2).

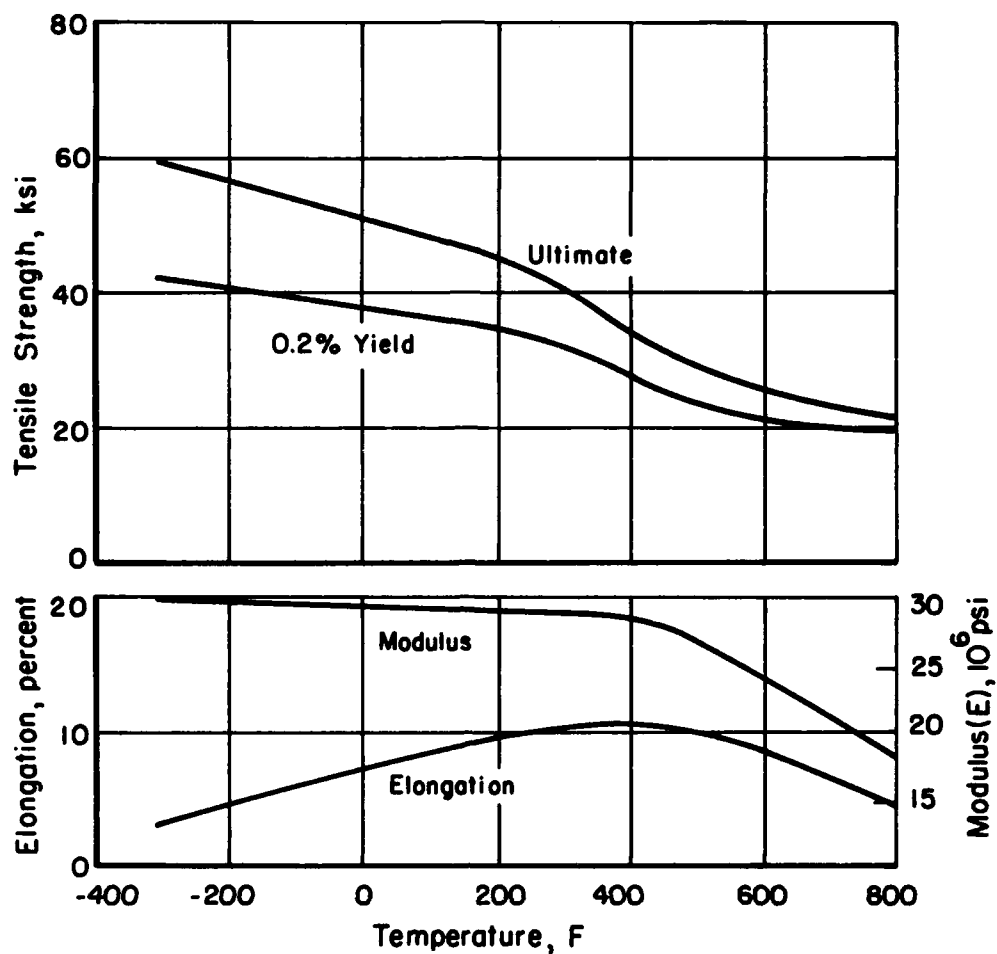


FIGURE 1. EFFECT OF TEMPERATURE ON THE TENSILE PROPERTIES OF 62Be-38Al ALLOY SHEET

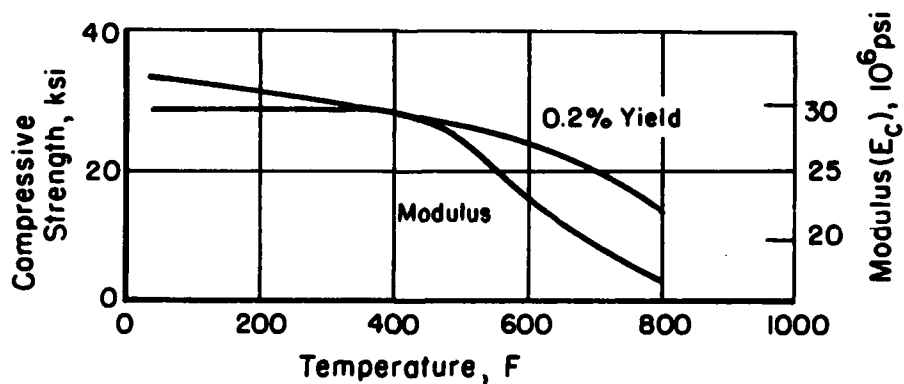


FIGURE 2. EFFECT OF TEMPERATURE ON THE COMPRESSIVE PROPERTIES OF 62Be-38Al ALLOY SHEET

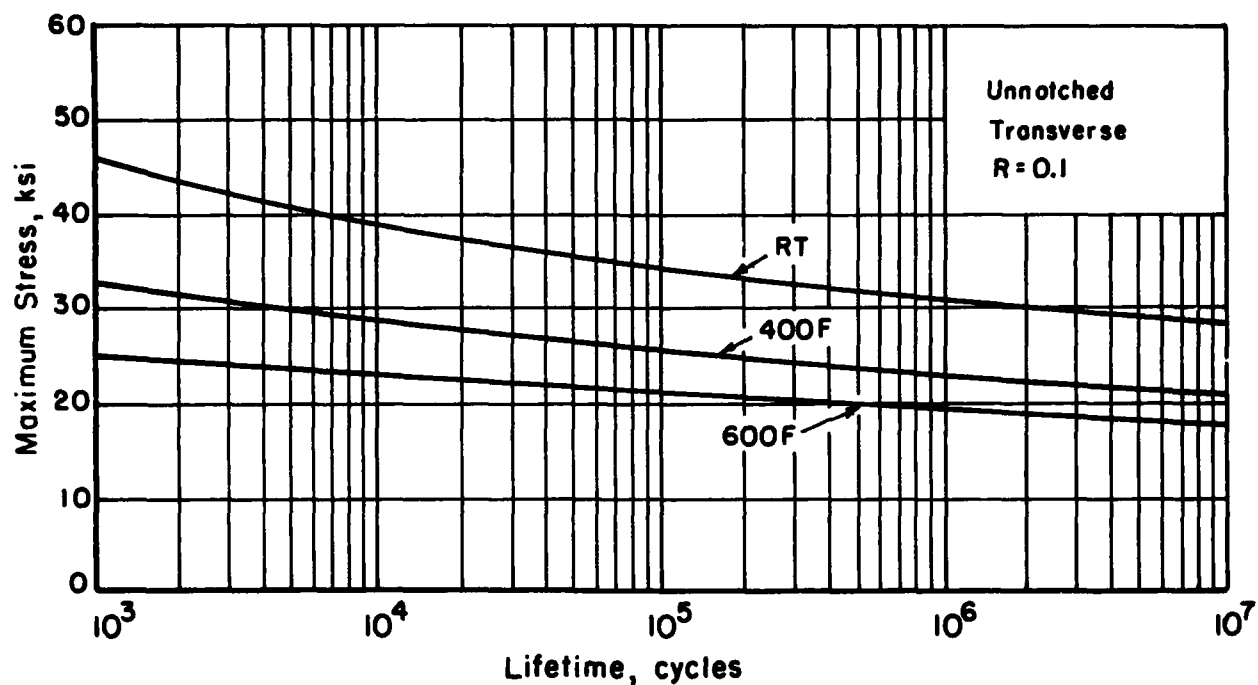


FIGURE 3. AXIAL-LOAD FATIGUE RESULTS FOR 62Be-38Al ALLOY SHEET

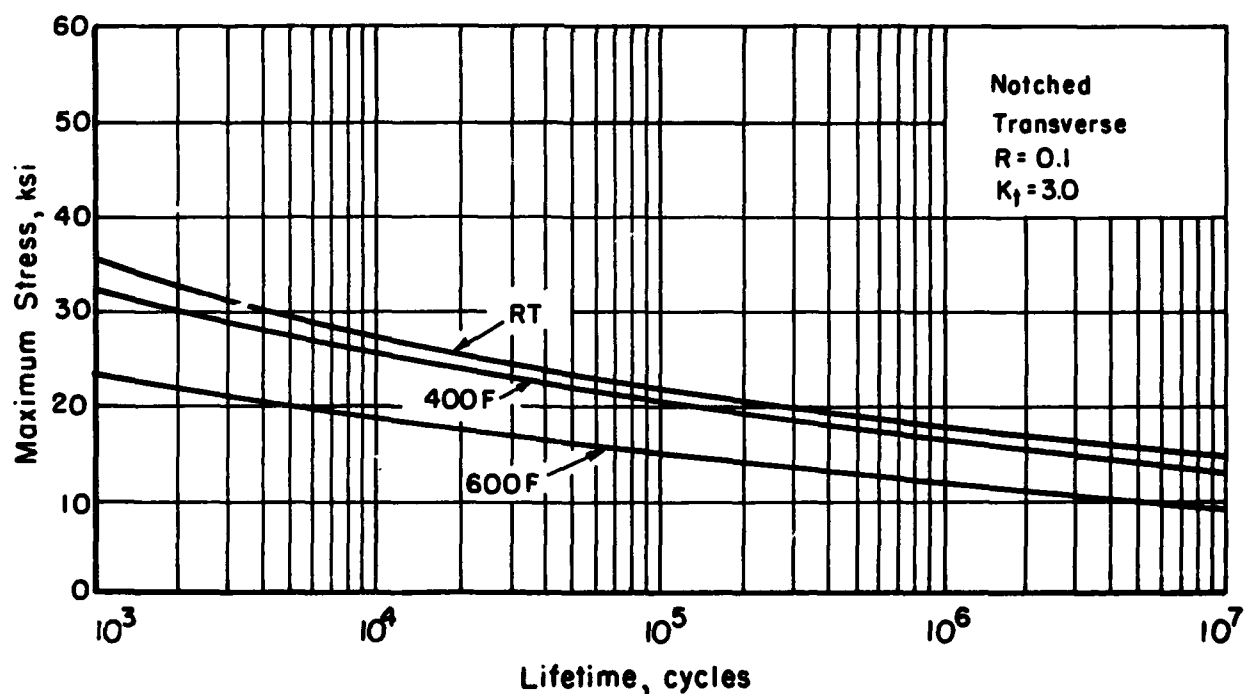
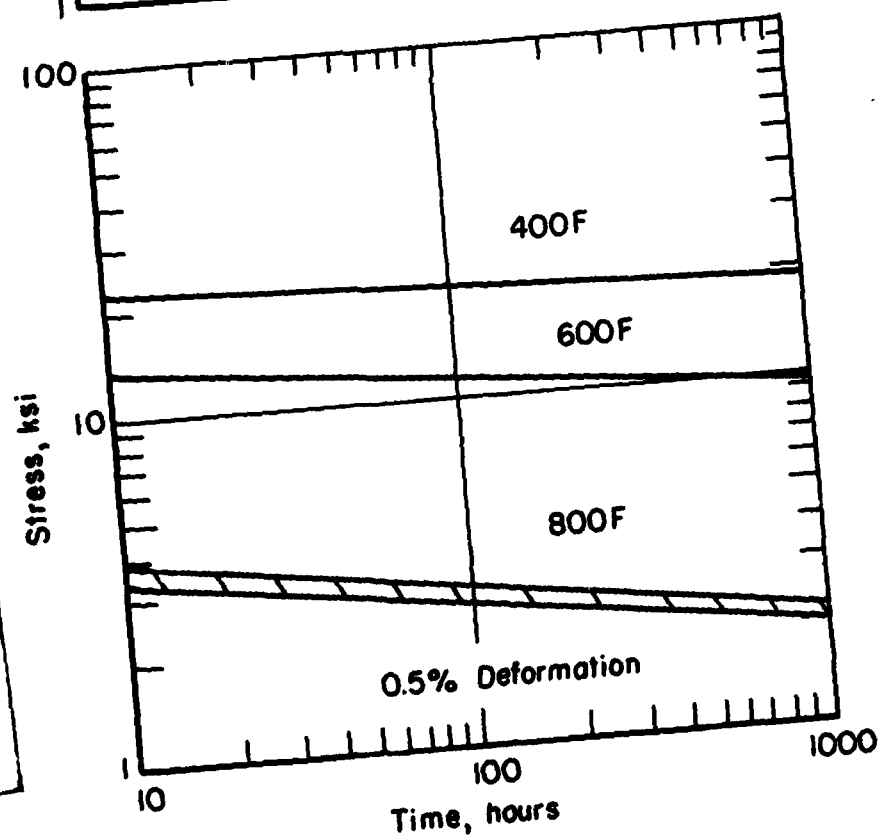
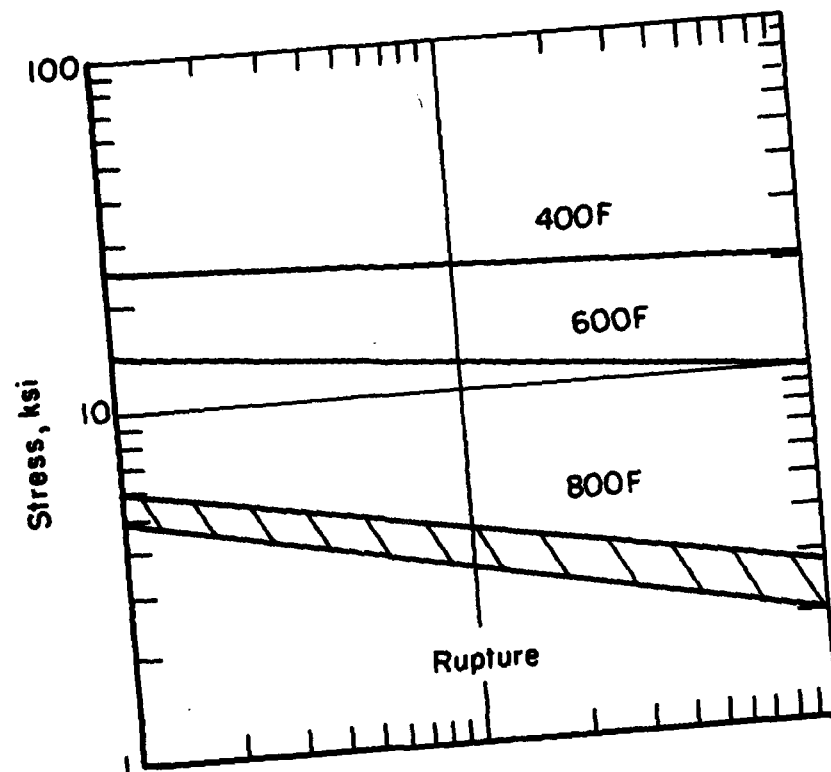


FIGURE 4. AXIAL-LOAD FATIGUE RESULTS FOR NOTCHED ($K_t = 3.0$) 62Be-38Al ALLOY SHEET



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FIGURE 5. STRESS-RUPTURE AND 0.5% DEFORMATION CURVES FOR 62Be-38Al ALLOY SHEET

REFERENCES

- (1) Fenn, R. W., Jr., et al, "Evaluation of Be-38% Al Alloy", Report NAS-8-11448, Materials Science Laboratory, Lockheed Missiles and Space Company (March, 1965).
- (2) Berylco Product Information, FDJ-864-1SM.